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Published in:
Journal of Environmental Law

DOI:
10.1093/jel/eqab032

Publication date:
2021

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Document Version
Publisher's PDF, also known as Version of record

Journal of Environmental Law, 2021, 00, 1–6
doi: 10.1093/jel/eqab032
Commentary

OXFORD

Using Sound Science Responsibly: Stories from the Scottish Seas and Hills

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One of the guiding principles set out in *One Future—Different Paths: The UK's Shared Framework for Sustainable Development*, adopted in 2005, was: 'using sound science responsibly'.[1] This is an admirable goal, although (applying a useful test for the significance of *all* vision and policy statements), it is hard to imagine anyone formally advocating for the opposite: irresponsibly acting in a way that either uses bad science or ignores good science. As so often, though, when it comes to contested situations in real-life, the way forward suggested by the broad principle is not so clear. Not everyone will agree on what science is 'sound' and there are many elements in deciding what uses are 'responsible'.

Aside from the challenge of finding a way of dealing with varying local, social, political, economic and ethical perspectives, there is an underlying difficulty in identifying the appropriate knowledge-base which should inform any discussion. Professional scientists carrying out academically verified studies are not the only source of knowledge. This commentary considers three situations where the tension between different forms of experience and research may emerge: where the overall picture identified by scientific research is contradicted by specific local examples, where the experience of those 'on the ground' leads them to reject scientific findings (with or without justification), and where the expert community itself recognises that the scientific evidence is far from complete.

As the discussion below shows, questions over the scientific basis for decisions and attitudes can give rise to tensions even in contexts where only a limited range of stakeholders are considered and where they share the same view on key ethical issues affecting humans' relationship with certain animals. When wider and more diverse communities are included—geographically, socially, ethically—the challenges are greatly increased. The disagreements over the meaning and application of knowledge in limited contexts serve only to highlight the difficulties faced more generally.

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1 DEFRA, *One Future – Different Paths: The UK's Shared Framework for Sustainable Development* (2005), 8.

The nature and use of knowledge have provided a topic of increasing research, ranging from the need and potential for transforming whole 'knowledge systems'[2] to specific challenges such as how citizen science can fit within models that have traditionally distinguished sharply between professional science and lay views.[3] Articles in this journal itself have further examined that distinction in the context of whether the contributions from those with local experience are viewed as providing 'knowledge' or just 'views',[4] and have suggested that in some contexts there is a marginalisation of lay as opposed to expert knowledge.[5] In some areas, such as the unknown territory of fracking, there may be a public hunger for science to lead the way,[6] but as discussed below, in others personal experience and science may clash, with unfortunate consequences.

The first situation where tension arises can be illustrated by the increasingly heated discussions over whether badgers pose a threat to other wildlife such as hedgehogs and ground-nesting birds. A research review for NatureScot noted that at a number of monitored sites 'badgers are not considered to be a significant factor affecting wader breeding success, though individual predation events occur from time to time'.[7] Yet that final caveat means that there will be those whose experience will be of a substantial impact by badgers on local populations, apparently contradicting the overall picture discovered. For example, in 2021, the Auchnerran site of the Game and Wildlife Conservancy Trust saw about two-thirds of the early lapwing nests lost to badgers.[8] This may be an aberration arising from short-lived local factors,[9] but it is easy to see how conflicts of view can arise, each based on sound observations, albeit different in scale. When individual experience contradicts the wider scientific conclusions, tension is inevitable.

Such different perceptions can be part of the background that leads to the position where there is a more widespread lack of trust between locals or stakeholders and the scientists. Towards the end of last century, a standard feature of the run-up to the annual allocation of fishing quotas around Scotland was the disagreement in the press between fishermen[10] (based on their daily experience) and fisheries scientists (based on different observations and modelling) over the state of the fish

2 Ioan Fazey and others, 'Transforming Knowledge Systems for Life on Earth: Visions of Future Systems and How to Get There' (2020) 70 Energy Research and Social Science [101724].

3 Raquel Ajates and others, 'Local Action with Global Impact: The Case of the GROW Observatory and the Sustainable Development Goals' (2020) 12(24) Sustainability [10518].

4 Margherita Pieraccini, 'Rethinking Participation in Environmental Decision-Making: Epistemologies of Marine Conservation in South-East England', (2015) 17 JEL 45.

5 Yvonne Rydin, Maria Lee and Simon Lock, 'Public Engagement in Decision-Making on Major Wind Energy Projects' (2015) 27 JEL 139.

6 Joanne Hawkins, '"We Want Experts": Fracking and the Case of Expert Excess' (2020) 32 JEL 1.

7 AJ Mitchell-Jones, *Badger Impacts on Biodiversity and Agriculture in Scotland: a Literature Review* (NatureScot Research Report No 1205, 2020) 12.

8 Dave Parish, 'Badger Predation at GWSDF Auchnerran' (Game and Wildlife Conservation Trust blog, 19 April 2021): <https://www.gwct.org.uk/blogs/news/2021/april/badger-predation-at-gwsdf-auchnerran/> (accessed 26 September 2021).

9 Dave Parish, 'Update on the Role of Badgers in Wader Clutch Predation at Auchnerran' (Game and Wildlife Conservation Trust blog, 17 May 2021):<https://www.gwct.org.uk/blogs/auchnerran-blog/2021/may/update-on-the-role-of-badgers-in-wader-clutch-predation-at-auchnerran/> (accessed 26 September 2021).

10 Still the factually accurate term, certainly on larger boats.

populations and therefore the size of catch allowable.[11] This was neatly captured in one press report:

> 'Most folk would say the scientists don't get it right,' said skipper Jim Cargill. 'Scientists? They would only know a fish on an effin' plate,' chimed in an anonymous eavesdropper at Aberdeen fishmarket.[12]

The situation is exacerbated by confirmation bias, the widespread tendency to give preference to evidence that supports existing views and beliefs.[13] This can mean that even when recourse is had to scientific studies rather than personal experience, single studies that point to the desired conclusion are seized on as providing the justification for actions that may not in fact be soundly based (and similarly, studies pointing the other way are more readily ignored or dismissed as flawed). An example is the impact of a single study which suggested that mountain hares were an important host for the spread to red grouse and their chicks of ticks and the 'louping ill' disease they carry.[14] This study was relied on by some grouse moor managers as justifying substantial culling of mountain hares. Subsequent research has shown severe limitations in that study and reached the firm conclusion that:

> There is no substantive evidence to support the population control of Mountain Hares as part of tick and/or Louping Ill virus control to benefit grouse, except under unusual circumstances.[15]

Yet the view survives that killing hares is not only an effective means of controlling ticks, but a scientifically justified one.

That example reveals the third problem, namely that 'the science' is never perfect or complete and can never tell the whole story, especially in the messy and dynamic natural world. We might hope that most poor quality work is rapidly weeded out. Anecdotal evidence in the early years of environmental impact assessments spoke of surveys carried out in mid-winter (or even when there was snow on the ground) when many features of the biodiversity on site were simply not present or invisible, or of access surveys carried out during the school holidays and missing the role of paths as busy routes to school.[16] Yet even the best of science cannot answer all of

11 The disagreements were exacerbated by further differences in how the position was framed. Studies based on individual species leading to species-based quota limits that were applied at the point of landing do not match the experience at sea of mixed catches. This led to the position where the search for fish species still legally available resulted in other species being caught but just discarded if the quota for these had been met (meaning that they could not lawfully be landed).

12 'Gross Net Loss' *Scotland on Sunday* (10 December 1995) Business section, 1.

13 See, for example, Uwe Peters, 'What Is the Function of Confirmation Bias?' (2020) Erkenntnis https://doi.org/10.1007/s10670-020-00252-1.

14 MW Gaunt and others, 'Definitive Identification of Louping Ill virus by RT-PCR and Sequencing in Field Populations of *Ixodes ricinus* on the Lochindorb Estate' (1997) 142 Archives of Virology 1181.

15 Grouse Moor Management Review Group, *Report to the Scottish Government* (Scottish Government 2019), 40 (Werritty Report).The author was a member of the Review Group.

16 Both examples show the vital role of public participation as offering a means to enhance or correct flawed 'scientific' findings.

the relevant questions. This was clearly demonstrated in the Scottish Government's Grouse Moor Management Review, reporting in 2019.[17] In his Chair's Preface, Prof Alan Werritty stated:

> In retrospect, although we have attempted throughout to be evidence-led, it is striking how many significant evidence gaps remain and how much of the fundamental science is contested. Especially problematic has been the tension between the 'expert' knowledge of scientists reported in peer-reviewed sources and 'local' knowledge held by practitioners based in the field. Even projects designed to clarify the position, such as those at Langholm, have left a contested legacy.[18]

Each of the aspects of management studied by the review revealed big gaps in the data, despite most of the issues having been present, and often contested, for decades.[19] As with all crime figures, the official figures on illegal raptor persecution do not reflect the likely true incidence of criminal behaviour. Large gaps in the study of muirburn[20] have been revealed by various studies, even before climate change added further questions to the agenda.[21] Basic variables such as the weather conditions and heat of the fire have not been fully incorporated into research, and the impacts on invertebrates scarcely examined.[22] On the more recent practice of providing medicated grit for grouse,[23] there have not been studies on whether the chemicals used to tackle parasites are reaching watercourses and posing a risk to other invertebrate fauna. For mountain hares, the conflicting evidence from scientists' surveys (of contested accuracy) and local experience of abundance (similarly contested) has been acknowledged and is being tackled by the establishment of a consistent and robust methodology for counting that should provide a clearer picture in future.[24]

In the absence of clear and complete scientific evidence, the ground is ripe for reaffirming pre-existing views on the merits or otherwise of various practices. There is no clear basis for overturning long-standing habits, or silencing critics of them. Personal experience may be available to fill the gap, but in hotly contested areas will be viewed as tainted by critics and attempts to add more objective support will remain vulnerable to the selective picking of snippets of research to confirm or refute what is being presented. Undertaking further studies attempting to resolve

17 Werritty Report (n 15).

18 ibid 3. On the Langholm Project, see below (n 25).

19 ibid 29–43.

20 The burning of old vegetation to create a patchwork of old and new growth heather which provides good habitat for red grouse (and some other species).

21 'Prescribed burning, under a changing climate, could either be a useful land management tool or a highly damaging process if implemented without sufficient impact research. Based on the current knowledge it is still unclear which category prescribed burning falls into in the UK.' Ashleigh Harper and others, 'Prescribed Fire and its Impacts on Ecosystem Services in the UK' (2018) 624 Science of The Total Environment 691, 701.

22 F Worrall and others, *Impacts of Burning Management on Peatlands* (Scientific Review for IUCN UK Peatland Programme 2010).

23 Grouse ingest grit to help them grind up their food and grit can be provided containing medicines to combat very harmful intestinal parasites.

24 Scotland's Moorland Forum, *Mountain Hare Counting Guidance* (2019).

uncertainties may provide useful information, but will take time and is unlikely to produce conclusive answers that all parties will draw the same lessons from.[25]

Such uncertainty has consequences for regulation. As the Covid pandemic has shown, although 'following the science' is a good idea, the science does not always point clearly in a single direction. Even if further studies could fill some of the gaps, decisions have to be taken before the results can be known. The Werritty Report concluded that scientific evidence alone could not provide the answers on the key issue of whether a licensing scheme should be introduced:

> This means that any recommendation to license grouse shooting although science-based inevitably involves expert judgment in which values and opinions also come into play. In making a recommendation in this area we are very aware of these challenges and note that at a societal level the final decision is ultimately a political one.[26]

Thus, although using sound science responsibly is not a bad ambition, it will not point clearly the way ahead. There is no single 'science' that will provide all the answers. We need to appreciate what different forms of knowledge and experience can and cannot do and where they come from. What 'the bloke down the road' says may be an unquestioning and self-serving repetition of what was being said generations ago or it may be the product of careful reflection on years of direct experience, representing a data-set unmatchable by any 'professional' science. The published science may be internally sound, but (for good practical and intellectual reasons) based on a study of only a thin slice of a multi-dimensional problem and therefore unable to provide a full picture. We need to value, but take a critical approach to, all sorts of knowledge, interrogating their origins and what they are based on, appreciating their strengths and weaknesses and accepting that in a dynamic world that is interconnected at all levels from the molecular to the global, there will never be a perfect understanding of what has been and will be happening.

Yet gathering the science/knowledge and assessing its soundness is only one step in determining the way forward. This knowledge has to be applied 'responsibly' and that raises further questions unanswerable on an objective basis. Returning to the grouse moor example, the socio-economic impacts of existing and alternative land uses are as poorly understood and contested as the physical ones,[27] whilst there is a cultural and ethical chasm between many supporters and opponents of 'traditional country pursuits'. Reconciling such differences so as to reach consensus is likely to be impossible, so that the focus turns to the decision-making processes that underlie environmental regulation and their legitimacy in the face of divisive issues.

The Royal Commission on Environmental Pollution explored this area in the late 1990s and its observations remain sound:

25 As demonstrated by the Langholm Moor Demonstration Project and the responses to it: <http://www.langholmproject.com/> (accessed 26 September 2021).

26 Werritty Report (n 15) 45.

27 ibid 15.

> Decisions about environmental policies must be based on the scientific evidence and an analysis of technological options, but they must also take into account risks and costs, and be informed by values.[28]
> . . ..
> There is no simple rule for determining the degree of caution which should be applied in particular cases. Sober evaluation of what is known and what is feared is a prerequisite to policies which are neither unduly restrictive nor heedless of often deeply held convictions about the environment.[29]

The Commission's discussion of techniques for better understanding issues of risk and values also remains worthy of study,[30] but each generation must find its own way forward. We need to settle on inclusive ways to reach decisions that are soundly based, responsible and responsive to the needs and values of the time, and do so in the face of ever-increasing urgency created by the climate and biodiversity crises. The responsible use of sound science (interpreted to include a wide range of knowledge sources) is a fine principle to follow, but leaves many questions to be answered.

28 Royal Commission on Environmental Pollution, *Twenty-first report: Setting Environmental Standards* (1998, Cm 4053), 113.

29 ibid 126.

30 ibid especially ch 8.